



QUEST ENVIRONMENTAL & ENGINEERING SERVICES, INC.

SDMS Document



93298

March 22, 2002

Mr. Al Inserra
Division of Responsible Party Site Remediation
NJDEP – BEECRA
401 East State Street, 5th floor
PO Box 028
Trenton, NJ 08625-0028

**RE: Administrative Consent Order (ACO)
In the Matter of Texaco Refining and Marketing Inc.
Getty Refining & Marketing, Inc.
Newark City, Essex County
ISRA Case #84455**

Dear Mr. Inserra:

On behalf of Texaco Refining and Marketing, Inc., Quest Environmental & Engineering Services, Inc. herewith submits for NJDEP review three copies of the enclosed Ground Water Monitoring Results Report. One copy of all laboratory deliverables and a diskette containing required NJDEP Hazsite EDD data is also included.

If you have any questions regarding this site, please contact me at (908) 735-8600.

Sincerely,
Quest Environmental & Engineering Services, Inc.

Ken Swider
Project Manager

Encl.

c: Jon Baldwin - Chevron Environmental Management Co.
Lou DeStefano - Klett, Rooney, Leiber & Schorling (Report only)
Paul Stendardi – Getty Petroleum Marketing Inc. (Report only)

Ground Water Monitoring Results Report

**Getty Newark Terminal
86 Doremus Avenue
Newark, New Jersey
ISRA Case # E84455**

Prepared for:
**Texaco, Inc.
PO Box 509
Beacon, New York 12508-0509**

Prepared by:
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1741 Route 31
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March 21, 2002

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Laboratory Analytical Data Package

Under a Separate Cover as Accutest Data Report N3068

1.0 Introduction

Texaco Refining and Marketing Inc. (TRMI) retained Quest Environmental & Engineering Services, Inc. (Quest) to conduct a round of ground water sampling of wells located at the Getty Petroleum Marketing, Inc. Terminal in Newark, New Jersey (ISRA Case No. 84455). The sampling was conducted to evaluate ground water quality as part of the ongoing monitoring program. Quest sampled wells on November 15, 2001 for analysis of volatile organic compounds and base neutral compounds. Section 2.0 describes field sampling and analytical methods, and Section 3.0 provides the sample analytical results.

2.0 Field Activities

Eleven (11) monitoring wells are currently in the monitoring program. Table 1 lists the wells and associated analytical parameters. Three wells were not sampled for analysis. MW-06 was not accessible for sampling because it was covered by remnants of a soil pile that had been staged in this area. Monitoring wells MW-12 and MW-18 also were not sampled due to the presence of free-phase hydrocarbon layers.

Ground water samples were collected using the procedures appearing in the *May 1992 NJDEP Field Sampling Procedures Manual*. All wells were checked for the presence of a measurable free phase hydrocarbon layer using an oil/water interface meter prior to sampling. Field parameters measured during well purging included pH, temperature, conductivity, and dissolved oxygen. Sample analytical parameters included volatile organic compounds (VO+15) plus a forward library search, methyl tert-butyl ether (MTBE), tert-butyl alcohol (TBA), and base neutrals extractable compounds (BN). Accutest Laboratories in Dayton, New Jersey (Cert. No. 12129) performed the laboratory analysis of samples. Appendix A provides details of the sampling methods and analytical procedures. A copy of the laboratory analytical data report (NJ Reduced Deliverables) is provided in a separate bound document as Volume II of this report. Accutest data report N3068 indicates that the VOC and BN analyses met all quality control criteria.

Table 1: Monitoring Well Sample Analysis Summary

| Laboratory ID | Field Sample No. | Sampling Date | Analysis |
|---------------|------------------|---------------|------------------------------|
| N3068-3 | MW-3 | 11/15/01 | VO+15, MTBE, TBA |
| N3068-2 | MW-4 | 11/15/01 | VO+15, MTBE, TBA, BN+15 |
| N3068-4 | MW-5 | 11/15/01 | VO+15, MTBE, TBA |
| - | MW-6 | 11/15/01 | not sampled - not accessible |
| N3068-8 | MW-7 | 11/15/01 | VO+15, MTBE, TBA |
| N3068-9 | MW-8 | 11/15/01 | VO+15, MTBE, TBA |
| N3068-7 | MW-9 | 11/15/01 | VO+15, MTBE, TBA, BN+15 |
| - | MW-12 | 11/15/01 | not sampled - product layer |
| N3068-6 | MW-16 | 11/15/01 | VO+15, MTBE, TBA, BN+15 |
| N3068-1 | MW-17 | 11/15/01 | VO+15, MTBE, TBA, BN+15 |
| - | MW-18 | 11/15/01 | not sampled - product layer |
| N3068-5 | Field Blank | 11/15/01 | VO+15, MTBE, TBA |
| N3068-10 | Trip Blank | 11/15/01 | VO+15, MTBE, TBA |

Notes:

VO+10 = Volatile Organic Compounds plus a library search of fifteen tentatively identified compounds (EPA 624)

MTBE = Methyl Tert Butyl Ether (624)

TBA = Tertiary Butyl Alcohol (624)

BN+15 = Base Neutral Extractable Compounds plus a library search of fifteen tentatively identified compounds (EPA 625)

3.0 Results

The following sections describe the sampling results including ground water elevations, free phase hydrocarbon measurements, well purging parameter measurements, and sample results.

3.1 Ground Water Elevations and Flow

Table 2 provides monitoring well specifications and ground water elevations calculated from depth to water level measurements obtained during sampling. Water table elevations are higher in the West Yard (4.6 ft above msl) and are lowest East Yard adjacent to the Passaic River (3.1 ft above msl). Figure 1 provides elevation contours prepared from linear interpolation of the ground water elevations. Ground water is unconfined and flows from higher to lower elevations, perpendicular to the elevation contours as shown in Figure 1. The elevation contours indicate that ground water flow is toward the northeast in the West Yard and toward the east in the East Yard, which is bordered by the Passaic River to the east. The northeast component to flow within the West Yard is believed to be influenced by the existence of a drainage swale located approximately 200 feet to the north. The hydraulic gradient of the water table is shallow, approximately 0.003 ft/ft across the site. Ground water flow obtained from the elevation contour map in Figure 1 is consistent with prior contour maps.

3.2 Free Phase Hydrocarbon Measurements

Table 2 also includes the results of free phase hydrocarbon measurements. Measurements were made using a Heron oil/water interface meter. Free phase hydrocarbon layers were detected in MW-12 (0.02 ft) and MW-18 (0.09 ft). The product layer in MW-18 was first measured during August 1997. Ground water samples for analysis dissolved petroleum hydrocarbons have not been collected since 1997. November 2001 was the first time a product layer was measurable in MW-12; however, a product sheen has been observed in MW-12 during prior sampling events. A product sheen was also observed on the purge water from well MW-8 during this November 2001 sampling event and also has been observed during prior sampling events.

Table 2 – Monitor Well Specifications, Ground Water Elevations and Product Measurements

| Well No. | Well Depth (ft.) | Screen Interval (ft.) | Top of PVC Casing Elev. (ft.) | Depth to Top of Screen ^a (ft.) | Depth to Water ^a (ft.) | Ground Water Elev. (ft.) | Product Thickness (ft) |
|----------|------------------|-----------------------|-------------------------------|---|-----------------------------------|--------------------------|------------------------|
| MW-3 | 17 | 2-17 | 7.24 | 1.5 | 2.63 | 4.61 | 0 |
| MW-4 | 10.5 | 0.5-10.5 | 6.97 | 1.2 | 2.40 | 4.57 | 0 |
| MW-5 | 10.5 | 0.5-10.5 | 6.86 | 0.5 | 2.36 | 4.50 | 0 |
| MW-6 | 10.5 | 0.5-10.5 | 5.05 | nm | nm | nm | nm |
| MW-7 | 10.5 | 0.5-10.5 | 8.21 | 3.2 | 4.28 | 3.93 | 0 |
| MW-8 | 17 | 2-17 | 6.86 | 1.6 | 3.48 | 3.38 | sheen |
| MW-9 | 5.5 | 0.5-5.5 | 6.14 | 0.5 | 3.12 | 3.37 | 0 |
| MW-12 | 10.5 | 0.5-10.5 | 6.25 | 0.5 | 2.91 | 3.36 ^b | 0.02 |
| MW-16 | 10 | 0.75-10 | 7.85 | 3.1 | 4.71 | 3.14 | 0 |
| MW-17 | 11 | 1-11 | 10.42 | 3.5 | 6.75 | 3.67 | 0 |
| MW-18 | 11 | 1-11 | 8.84 | 3.5 | 4.79 | 4.03 ^b | 0.09 |

Notes:

- (1) ^a measured from top of PVC casing.
- (2) Ground water elevations are in feet above Mean Sea Level (MSL).
- (3) Depth to water and product measurements were obtained on November 15, 2001.
- (4) nm = not measured
- (5) ^b corrected water elevation using: $Z_{aw} = (1-p)Z_{ow} + pZ_{ao}$, where Z_{aw} = air/water table elevation, Z_{ow} = oil/water table elevation Z_{ao} = air/oil elevation, and p = oil specific gravity (assumed = 0.85)

Field and Trip Blanks

Field and Trip blank VOC concentrations were non-detectable.

3.3 Ground Water Sample Analytical Results

Tables 3 summarizes the analytical results for the East Yard and West Yard well samples. Detected compound concentrations are compared to NJDEP Class II-A Ground Water Quality Standards (GWQS). The Class II-A Standards apply to ground water having a designated use as potable water or conversion to potable water and are shown only as a relative indicator of ground

water quality at the site. The Practical Quantitation Limits (PQLs) listed in the tables are the reliable detection limit for the named compound and are used as the standard if the health-based criteria (GWQS) are less than the PQL. Per NJDEP requirements, ground water concentrations at downgradient wells MW-7, MW-8, MW-12 and MW-16 are also compared to N.J.A.C. 7:9B-1.14 Surface Water Quality Criteria applicable to the Passaic River (saline estuarine waters – SE III). The analytical results are also illustrated in Figures 2 and 3. Table 4 provides Field and Trip Blank data, and Tables 5 and 6 list the November 2001 sample results with the prior four sampling events for VOCs and BNs, respectively.

East Yard

Volatile organic compounds (VOCs) detected in well samples include benzene, toluene, ethylbenzene, total xylenes, MTBE and TBA (Table 3 and Figure 2). Benzene was the only VOC exceeding Class II-A GWQS (1 µg/L) in the East Yard wells. The highest benzene concentration was detected in well MW-8 (161 µg/L) located downgradient of the aboveground storage tanks. MW-12 also detected an elevated benzene concentration in this area during prior sampling events. The concentration of benzene detected in MW-8 also exceeds the Surface Water Quality Standard of 71 µg/L. MTBE was detected in each East Yard well at concentrations ranging from 2.0 µg/L (MW-16) to 16.8 µg/L (MW-8), which are less than the 70 µg/L GWQS. TBA was detected in wells MW-7 (81.1 µg/L) and MW-8 (249 µg/L), which are less than the Class II-A interim specific criterion of 500 µg/L for TBA. Review of BTEX concentrations over the last five sampling events indicates variable levels with no apparent significant trends. MTBE levels are trending downward in MW-8 and MW-9 since 1999, and may be on the rise in MW-16. TBA levels also appear to be on the rise in MW-8.

Base neutral compounds measured in wells MW-9 and MW-16 indicate low to non-detectable concentrations (Figure 3). None of the BNs detected in MW-9 exceed ground water or surface water standards.

West Yard

Benzene, chlorobenzene and MTBE were detected at concentrations exceeding Class II-A criteria in some West Yard Wells. MW-3 detected 362 µg/L of benzene, 648 µg/L of MTBE, and 55.8 µg/L of chlorobenzene, which exceed the GWQS. MW-4 detected benzene (1.5 µg/L) marginally exceeding the GWQS of 1 µg/L. MW-5 had an elevated level of MTBE at 1,990 µg/L. Other VOCs were not detected in MW-5, but the reported detection limits were elevated due to the MTBE. Well MW-17, which is downgradient of MW-3, MW-4 and MW-5, indicated

only low concentrations of MTBE and TBA. Generally no significant BTEX concentration trends are observed in West Yard wells over the past five monitoring events. MTBE, however, was substantially higher in MW-3 and MW-5 compared to the prior July 2000 sampling event.

Base neutral compounds were measured in MW-4 and MW-17. Generally non-detectable or low levels of BNs were detected with the exception of n-nitrosodiphenylamine, which was measured in MW-4 at a level (129 $\mu\text{g}/\text{L}$), exceeding the GWQS of 20 $\mu\text{g}/\text{L}$ (PQL). N-nitrosodiphenylamine has shown variable concentrations in MW-4 since July 1998 (Table 6), but generally has not been detected in downgradient well MW-7 during this time period.

Table 3 - Sample Analytical Results - November 2001
Getty Newark Terminal

EAST YARD WELLS

| Monitor Well Samples | MW-7 | MW-8 | MW-9 | MW-12 | MW-16 | N.J.A.C. Class II-A GW Quality Standards (ug/L) | | Surface Water Criteria (ug/L) |
|--|------------|-------|-----------|-------|------------|--|-----|-------------------------------------|
| | | | | | | GWQS | PQL | |
| Detected Volatile Organics (ug/L) | | | | | | | | |
| Benzene | nd (<0.27) | 161 | 37.6 | na | 2.5 | 0.2 | 1 | 71 |
| Toluene | nd (<0.62) | 6.1 | 1.3 | na | nd (<0.62) | 1,000 | 5 | 200,000 |
| Ethylbenzene | nd (<0.60) | 1.5 | nd (<0.6) | na | nd (<0.60) | 700 | 5 | 27,900 |
| Xylenes (Total) | d (<0.1.2) | 10.4 | 2.9 | na | nd (<1.2) | 1,000* | 2 | NA |
| MTBE | 5.5 | 16.8 | 2.5 | na | 2.0 | 70* | NA | NA |
| TBA | 81.1 | 249 | nd (<6.6) | na | nd (<6.6) | 500* | NA | NA |
| Total VO TIC's (estimated) | 0 | 1,501 | 486 | na | 68.8 | NA | NA | NA |
| Detected Base Neutrals (ug/L) | | | | | | | | |
| Acenaphthene | - | - | 0.21 | na | nd (<0.21) | 400 | 10 | NA |
| Anthracene | - | - | 0.28 | na | nd (<0.11) | 2,000 | 10 | 108,000 |
| Fluorene | - | - | 1.5 | na | nd (<0.2) | 300 | 10 | NA |
| Phenanthrene | - | - | 1.1 | na | nd (<0.16) | NA | 10 | NA |
| Total BN TIC's (estimated) | - | - | 120.3 | na | 0 | NA | NA | NA |

WEST YARD WELLS

| Monitor Well Samples | MW-3 | MW-4 | MW-5 | MW-17 | MW-18 | N.J.A.C. Class II-A GW Quality Standards (ug/L) | |
|--|---------|------------|-----------|-------------|-------|--|-----|
| | | | | | | GWQS | PQL |
| Detected Volatile Organics (ug/L) | | | | | | | |
| Benzene | 362 | 1.5 | nd (<5.4) | nd (<0.27) | na | 0.2 | 1 |
| Toluene | 23 | 0.94 | nd (<12) | nd (<0.62) | na | 1,000 | 5 |
| Ethylbenzene | 3.8 | nd (<0.60) | nd (<12) | nd (<0.60) | na | 700 | 5 |
| Xylenes (Total) | 43.3 | 3.6 | nd (<23) | nd (<0.1.2) | na | 1,000* | 2 |
| Chlorobenzene | 55.8 | nd (<0.31) | nd (<6.1) | nd (<0.31) | na | 50* | 2 |
| 1,4-Dichlorobenzene | 2.5 | nd (<0.70) | nd (<14) | nd (<0.70) | na | 75 | 5 |
| MTBE | 648 | 52.2 | 1,990 | 2.0 | na | 70* | NA |
| TBA | nd (16) | 31.2 | nd (<130) | 10 | na | 500* | NA |
| Total VO TIC's (estimated) | 7,094 | 34 | 0 | 0 | na | NA | NA |
| Detected Base Neutrals (ug/L) | | | | | | | |
| N-Nitrosodiphenylamine | - | 129 | - | nd (<0.16) | na | 7 | 20 |
| Phenanthrene | - | 1.5 | - | nd (<0.15) | na | 3 | 30 |
| Total BN TIC's (estimated) | - | 199.5 | - | 149.8 | na | NA | NA |

nd = Not Detected

J = Estimated value below detection limit

GWQS = Ground Water Quality Standards

* = Interim Specific Water

"-" = Not Analyzed

TBA = Tertiary Butyl Alcohol

PQL = Practical Quantitation Limit

Quality Criteria

NA = Not Available

MTBE = Methyl Tert Butyl Ether

Bold values exceed higher of GWQS and PQL.

Only those compounds detected in at least one sample are listed above, all others were not detected.

**Table 4 - Field and Trip Blank Analytical Results
Getty Newark Terminal**

| Parameter | November 15, 2000 (ug/L) |
|-------------------------------|-----------------------------|
| <u>Field Blank</u> | |
| Volatile Organics + 15 | |
| Target VOCs | nd |
| MTBE | nd (< 0.26) |
| TBA | nd (< 6.6) |
| Total TIC (estimated) | 0 |
| Base Neutrals + 15 | |
| Target BNs | nd |
| Total TIC (estimated) | 4.7 |
| <u>Trip Blank</u> | |
| Volatile Organics+10 | |
| Target VOCs | nd |
| MTBE | nd (< 0.26) |
| TBA | nd (< 6.6) |
| Total TIC (estimated) | 0 |

Notes:

nd = not detected

TIC = Tentatively Identified Compounds

Table 5 - Volatile Organic Compound Results Summary - Jan 1999 through Nov 2001
Getty Newark Terminal

| Monitor Well Samples | MW-3 | | | | | MW-4 | | | | |
|---------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | Jan-99 | Jun-99 | Dec-99 | Jul-00 | Nov-01 | Jan-99 | Jun-99 | Dec-99 | Jul-00 | Nov-01 |
| Volatile Organics (ug/L) | | | | | | | | | | |
| Benzene | 376 | 433 | 396 | 771 | 362 | nd | nd | 0.8 | nd | 1.5 |
| Toluene | 27.3 | 22.4 | 31.7 | 24.2 | 23 | nd | nd | 0.37 | 0.49 | 0.94 |
| Ethylbenzene | 7.6 | 3.9 | 7.5 | 4.3 | 3.8 | nd | nd | nd | nd | nd |
| Xylenes (Total) | 52.3 | 44.2 | 65.2 | 44.6 | 43.3 | 1.9 | 1.1 | 1.9 | 0.76 | 3.6 |
| Chlorobenzene | 44.5 | 72.1 | 51.9 | 174 | 55.8 | nd | nd | nd | nd | nd |
| 1,4 dichlorobenzene | 1.5 | nd | 1.4 | 2.4 | 2.5 | nd | nd | nd | nd | nd |
| MTBE | 15.6 | 76.7 | 122 | 114 | 648 | 29 | 28.8 | 59 | 16.5 | 52.2 |
| TBA | nd | nd | 18.7 | 39 | 31.2 | nd | 13.7 | 29.8 | 18.8 | 31.2 |
| Total VO TIC's (estimated) | 1098 | 1143 | 1,620 | 1,097 | 7,094 | 3.2 | 17 | 11 | 7.7 | 34.0 |

| Monitor Well Samples | MW-5 | | | | | MW-7 | | | | |
|---------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | Jan-99 | Jun-99 | Dec-99 | Jul-00 | Nov-01 | Jan-99 | Jun-99 | Dec-99 | Jul-00 | Nov-01 |
| Volatile Organics (ug/L) | | | | | | | | | | |
| Benzene | nd | 9.9 | 23.2 | 24.5 | nd | nd | 9.9 | 23.2 | 1.8 | nd |
| Toluene | nd | nd | 1.3 | 2.6 | nd | nd | nd | 1.3 | 0.64 | nd |
| Ethylbenzene | nd | nd | nd | 0.37 | nd | nd | nd | nd | nd | nd |
| Xylenes (Total) | nd | 9.4 | 13.1 | 16.9 | nd | nd | 9.4 | 13.1 | nd | nd |
| MTBE | 492 | 472 | 286 | 336 | 1,990 | 25 | 20.7 | 12 | 23 | 5.5 |
| TBA | nd | 29.2 | 19.1 | 46 | nd | 30.7 | 135 | 20.9 | 110 | 81.1 |
| Total VO TIC's (estimated) | 42 | 195.8 | 260 | 428 | 0 | 30.8 | 4.6 | 0 | 0 | 0 |

| Monitor Well Samples | MW-8 | | | | | MW-9 | | | | |
|---------------------------------|--------|--------|--------|--------|-------|--------|--------|--------|--------|------|
| | Jan-99 | Jun-99 | Dec-99 | Jul-00 | | Jan-99 | Jun-99 | Dec-99 | Jul-00 | |
| Volatile Organics (ug/L) | | | | | | | | | | |
| Benzene | 164 | 184 | 157 | 168 | 161 | 20.3 | 21.4 | 30.6 | 17.1 | 37.6 |
| Toluene | 4.5 | 6.2 | 5.4 | 5.7 | 6.1 | nd | 0.95 | 1.1 | 0.85 | 1.3 |
| Ethylbenzene | 1.4 | 2.4 | 2.8 | 1.8 | 1.5 | nd | nd | nd | nd | nd |
| Xylenes (Total) | 10.5 | 16.7 | 16.6 | 28 | 10.4 | nd | 0.75 | 1.2 | 1.2 | 2.9 |
| MTBE | 74.4 | 42.1 | 28.3 | 24.9 | 16.8 | 9.9 | 15.1 | 19.8 | 11.2 | 2.5 |
| TBA | 93.5 | 95.6 | 327 | 202 | 249 | nd | nd | nd | 14.4 | nd |
| Total VO TIC's (estimated) | 1,105 | 1,212 | 1,240 | 1,371 | 1,501 | 191 | 276 | 199 | 299 | 486 |

NOTES:

TBA = Tertiary Butyl Alcohol

MTBE = Methyl Tert Butyl Ether

nd = Not Detected

Table 5 - Volatile Organic Compound Results Summary - Jan 1999 through Nov 2001
Getty Newark Terminal

| Monitor Well Samples | MW-12 | | | | | MW-16 | | | | |
|---------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | Jan-99 | Jun-99 | Dec-99 | Jul-00 | Nov-01 | Jan-99 | Jun-99 | Dec-99 | Jul-00 | Nov-01 |
| Volatile Organics (ug/L) | | | | | | | | | | |
| Benzene | 264 | 126 | 244 | 214 | na | 2.1 | 1.6 | 2.5 | 3.4 | 2.5 |
| Toluene | 8.7 | 4.4 | 9.4 | 6.7 | na | nd | nd | nd | nd | nd |
| Ethylbenzene | 5.5 | 3.3 | 6 | 3.2 | na | nd | nd | nd | nd | nd |
| Xylenes (Total) | 27.6 | 12.0 | 30.9 | 20.3 | na | nd | nd | nd | nd | nd |
| MTBE | 129 | 49.6 | 73.3 | 38 | na | nd | nd | nd | 3.2 | 2 |
| TBA | 205 | 1,030 | 124 | 334 | na | nd | nd | nd | nd | nd |
| Total VO TIC's (estimated) | 1,339 | 1,309 | 1,310 | 1,372 | na | 781 | 154 | 78 | 154 | 69 |

| Monitor Well Samples | MW-17 | | | | |
|---------------------------------|--------|--------|--------|--------|--------|
| | Jan-99 | Jun-99 | Dec-99 | Jul-00 | Nov-01 |
| Volatile Organics (ug/L) | | | | | |
| Benzene | nd | nd | nd | nd | nd |
| Toluene | nd | nd | nd | nd | nd |
| Ethylbenzene | nd | nd | nd | nd | nd |
| Xylenes (Total) | nd | nd | nd | nd | nd |
| MTBE | nd | 3.7 | 1.5 | 3.7 | 2 |
| TBA | nd | nd | nd | nd | 10 |
| Total VOC TIC's (estimated) | 3.6 | 0 | 0 | 0 | 0 |

NOTES:

nd = Not Detected

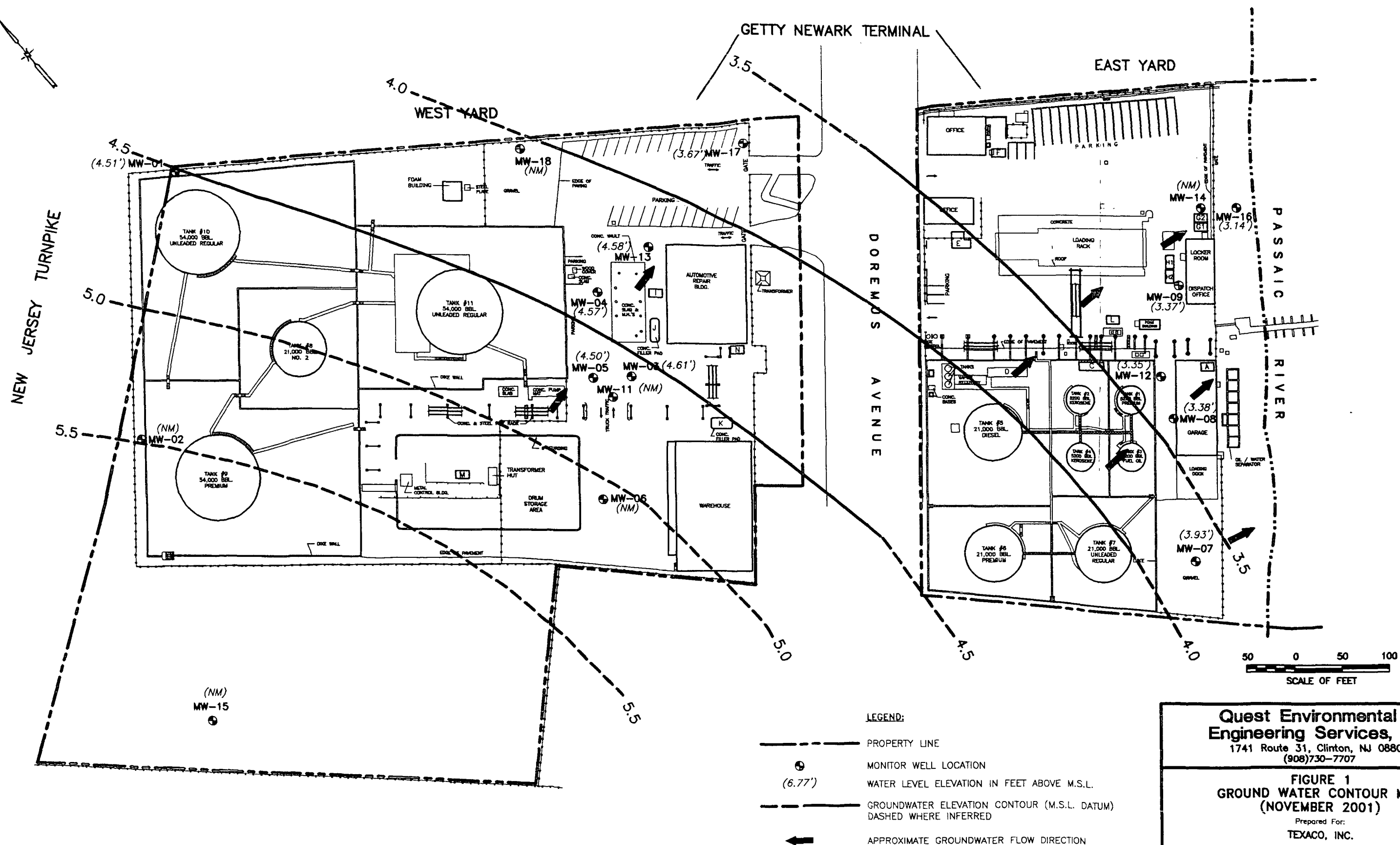
TBA = Tertiary Butyl Alcohol

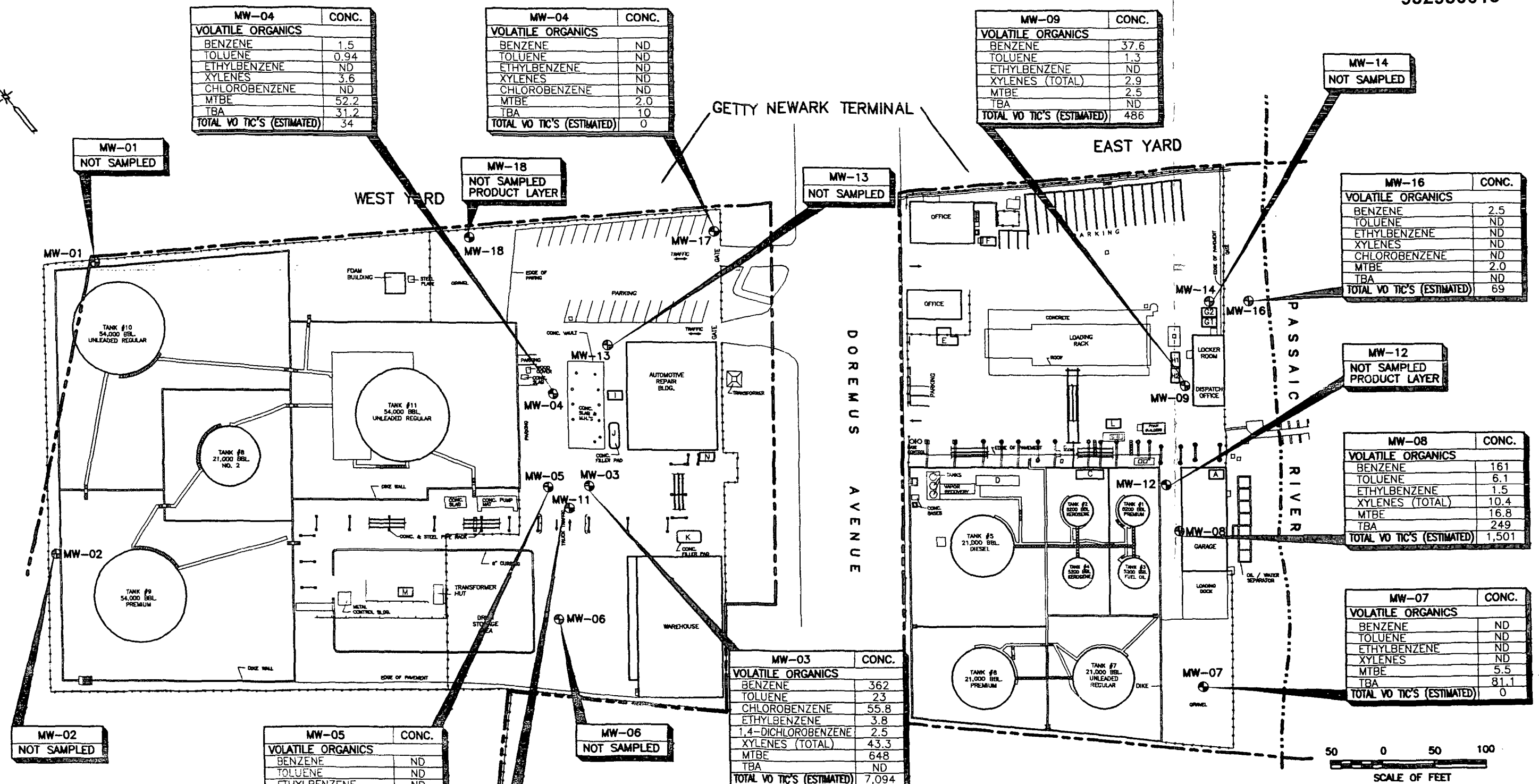
MTBE = Methyl Tert Butyl Ether

Table 6 - Base Neutral Compound Summary - July 1998 through November 2001
Getty Newark Terminal

| Monitor Well Samples | MW-4 | | | | | | MW-17 | | | | | |
|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | Jul-98 | Jan-99 | Jun-99 | Dec-99 | Jul-00 | Nov-01 | Jul-98 | Jan-99 | Jun-99 | Dec-99 | Jul-00 | Nov-01 |
| Base Neutrals (ug/L) | | | | | | | | | | | | |
| Naphthalene | 1.4 | nd | 0.95 J | nd | na | nd | nd | nd | nd | nd | na | |
| Acenaphthene | nd | 0.7 | 1.4 | 0.8 J | na | nd | nd | nd | nd | nd | na | |
| N-Nitrosodiphenylamine | 48.1 | 100 | 124 | 26.9 | na | 129 | nd | nd | 2 | nd | na | |
| Anthracene | - | - | 0.71 J | nd | na | nd | nd | nd | nd | nd | na | |
| Benzidine | - | - | 10.3 | nd | na | nd | nd | nd | nd | nd | na | |
| 4-Chloroaniline | - | - | 3.6 | nd | na | nd | nd | nd | 5.5 | nd | na | |
| Phenanthrene | - | - | 1.5 | nd | na | 1.5 | nd | nd | nd | nd | na | |
| Total BN TIC's (estimated) | 157 | 200.4 | 272.4 | 272.4 | na | 200 | 0 | 3.6 | 0 | 0 | na | |

| Monitor Well Samples | MW-9 | | | | | | MW-16 | | | | | |
|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | Jul-98 | Jan-99 | Jun-99 | Dec-99 | Jul-00 | Nov-01 | Jul-98 | Jan-99 | Jun-99 | Dec-99 | Jul-00 | Nov-01 |
| Base Neutrals (ug/L) | | | | | | | | | | | | |
| Acenaphthene | 6.4 | 2.6 | nd | 4.3 | na | 0.21 | nd | nd | nd | nd | na | nd |
| Fluorene | 5 J | 2.5 | 4.2 | 3.1 | na | 1.5 | nd | nd | nd | nd | na | nd |
| Phenanthrene | 4.4 | 12 J | 3.2 | 2.4 | na | 1.1 | nd | nd | nd | nd | na | nd |
| Anthracene | 1.3 | 0.64 J | nd | 0.51 J | na | 0.28 | nd | nd | nd | nd | na | nd |
| Fluoranthene | 1.6 | 2.8 | 2.5 | 0.66 J | na | nd | nd | nd | nd | nd | na | nd |
| Pyrene | 1.6 | 3.6 | 5.0 | 0.58 J | na | nd | nd | nd | nd | nd | na | nd |
| Chrysene | nd | 1.9 | 1.7 | nd | na | nd | nd | nd | nd | nd | na | nd |
| Benzo(a)anthracene | nd | 1.9 | 1.4 | nd | na | nd | nd | nd | nd | nd | na | nd |
| Benzo(a)pyrene | nd | 4.7 | 2.0 | nd | na | nd | nd | nd | nd | nd | na | nd |
| Benzo(b)fluoranthene | nd | 3.5 | 1.9 | nd | na | nd | nd | nd | nd | nd | na | nd |
| Benzo(k)fluoranthene | nd | 3.3 | 0.91 J | nd | na | nd | nd | nd | nd | nd | na | nd |
| Benzo(g,h,i)perylene | nd | 3.3 | 1.4 J | nd | na | nd | nd | nd | nd | nd | na | nd |
| Indeno(1,2,3-cd)pyrene | nd | 3.2 | 1 J | nd | na | nd | nd | nd | nd | nd | na | nd |
| Bis(2-Ethylhexyl)Phthalate | nd | 1.1 J | 1.5 J | nd | na | nd | nd | nd | nd | nd | na | nd |
| Total BN TIC's (estimated) | 425 | 215 | 428 | 199 | na | 120 | 0 | 76 | 33 | 19 | na | 0 |





LEGEND:

PROPERTY LINE

MONITOR WELL LOCATION

ND NOT DETECTED

ESTIMATED VALUE BELOW DETECTION LIMIT

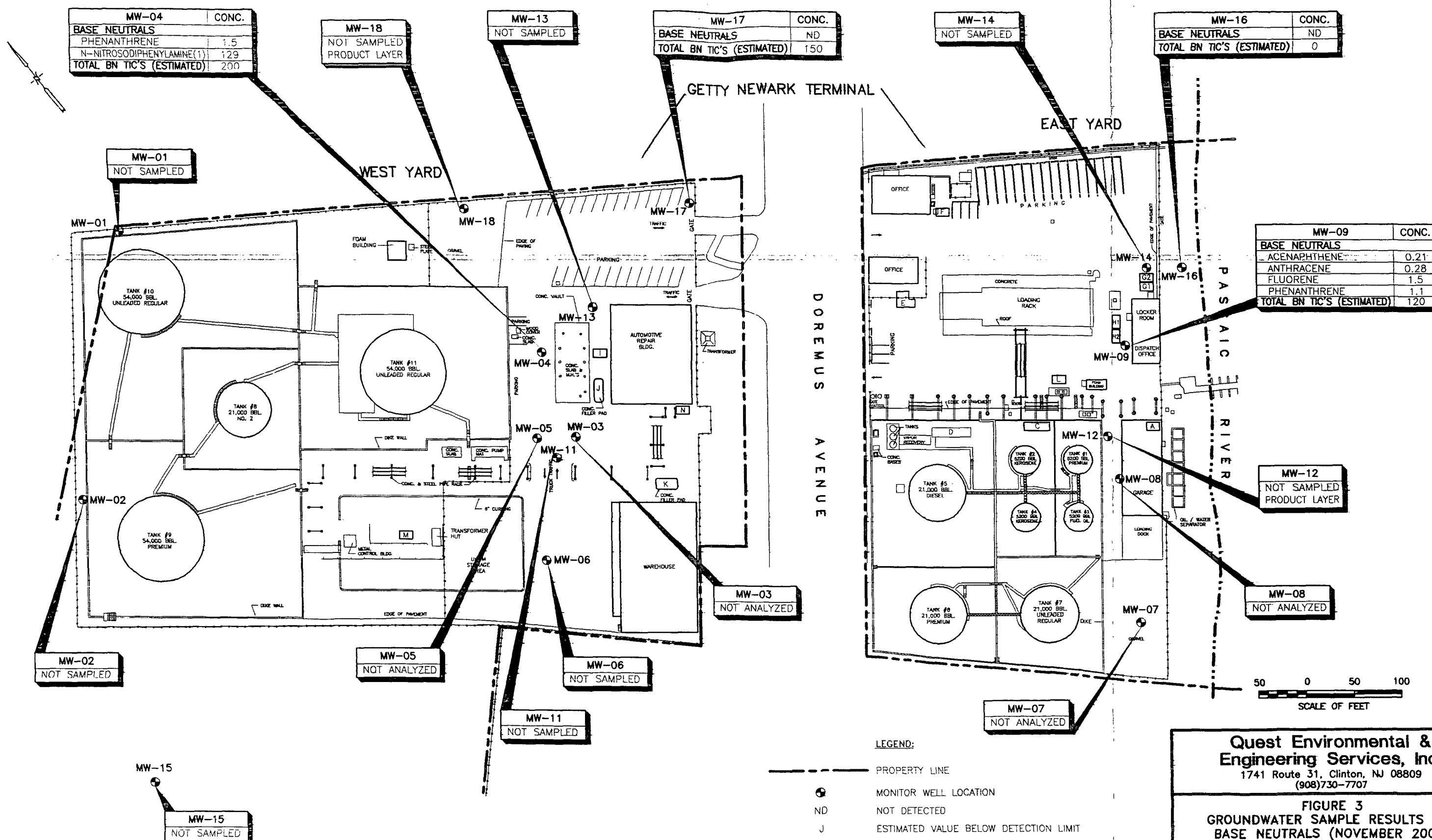
ALL SAMPLE RESULTS IN MICROGRAMS PER LITER (ug/l)

ONLY THOSE BN'S THAT WERE DETECTED ARE SHOWN. ALL OTHERS WERE NOT DETECTED.

Quest Environmental & Engineering Services, Inc.

1741 Route 31, Clinton, NJ 08809
(908)730-7707FIGURE 2
SAMPLE RESULTS FOR
VOLATILE ORGANICS (NOVEMBER 2001)Prepared For:
TEXACO, INC.

| CLIENT NO. | FILE NO. | CHK'D: | DRAWING NUMBER | REV. NO. |
|------------|----------|---------------|----------------|----------|
| 11001 | - | ENG. APPV. | FGW1101 | |



Quest Environmental & Engineering Services, Inc.
 1741 Route 31, Clinton, NJ 08809
 (908)730-7707

FIGURE 3
GROUNDWATER SAMPLE RESULTS FOR
BASE NEUTRALS (NOVEMBER 2001)
 Prepared For:
TEXACO, INC.

| CLIENT NO. | FILE NO. | CHK'D: | DRAWING NUMBER | REV. NO. |
|------------|----------|--------|----------------|----------|
| 11001 | - | ENG. | FGW1101 | |
| | | APP'D. | | |

Appendix A

Field Sampling and Analytical Methods

Appendix A – Field Sampling and Analytical Methods

Monitor Well Sampling

Monitor wells were sampled following the procedures in the *NJDEP Field Sampling Procedures Manual, May 1992*. Quest sampled monitor wells according to the following procedure:

1. The following information was recorded on a field sampling log: project name; date; weather condition; samplers; method of purging; well numbers; and sampling/purging times. A copy of the field logs appears at the end of this appendix.
2. Wells were first checked for a free product layer using a Heron oil/water interface meter. Then, the depth to water and depth to well bottom was measured from the top of inner well casings using an electronic water-gauging tape. The data was recorded on the field log.
3. Prior to purging and sampling each well, the volume of the water column was calculated using the well diameter and height of the water column. Monitor wells were purged approximately three volumes except in MW-7 and MW-9, which were purged less than three volumes in order to prevent the well from pumping dry. Purging was accomplished using a Whale submersible purger and new polyethylene tubing. The tubing was discarded after each use. Purging rates were 0.5 gallons per minute or less. Before, during and after purging the well, samples were collected to measure pH, temperature, conductivity, and dissolved oxygen using a field meter (Horiba U-10). The measurements were recorded on the field log.
4. Ground water samples were collected using disposable Teflon™ bailers which were slowly lowered and retrieved using a polypropylene rope. Ground water collected in each bailer was poured directly from the bailer into the appropriate sample containers. After sampling, a sample was measured for pH, temperature, conductivity, and dissolved oxygen.
5. Sample containers were labeled, logged on a chain-of-custody document, and placed in a sample shuttle containing ice packs.

A field blank was collected from a new bailer to ensure that no contaminants were introduced from the bailers into ground water samples. The field blank was collected by pouring demonstrated analyte-free water obtained from the laboratory into the bailer and collecting the rinsate directly into the sample containers. The field blank was logged on the chain-of-custody document and placed into the sample shuttle. A trip blank accompanied samples in the sample shuttle during sampling and transport from and to the laboratory.

Laboratory Analysis

Accutest Laboratories, located in Dayton, New Jersey (Certification No. 12129), performed the laboratory analysis of samples. Samples were analyzed for the following parameters and methods:

| <u>Parameter</u> | <u>Matrix</u> | <u>Method</u> |
|---|---------------|----------------|
| Volatile Organic Compounds+15, MTBE, TBA | Water | EPA Method 624 |
| Base Neutral Compounds+15 | Water | EPA Method 625 |

Samples were analyzed within the required holding times from the time of collection. New Jersey Reduced Data Deliverables per N.J.A.C. 7:26E were used for quality assurance. The laboratory data deliverables are included under a separate cover to this report as Accutest Data Report No. N3068.

Quest Environmental & Engineering Services, Inc.
Monitoring Well Field Sampling Record

Project: Getty Newark
Doremus Ave
Well #: MW-3

Date: 11/15/01
Weather: 50s, overcast
Personnel: ANM, AJR

Initial Measurements:

PID (ppm): —
pH: 8.01
Temp: 17.0
Cond: 2.13
Oxygen: 8.86

Conversion Factors:

| Diam. | Gal/Ft. |
|-------|---------|
| 2" | 0.16 |
| 4" | 0.65 |
| 6" | 1.46 |

Well Diameter: 4"
Total Depth: 16.0'
Depth to Water: 2.63
Depth to Product: N/A
Product Thickness: N/A
Water Col. Height: 13.37
Conversion Factor: ~~0.26~~ 0.65
Gallons in Well: 8.69
Gallons to Purge: 26.07
Approx. Pump Intake Depth: 14'

Well Evacuation:

Pump Type/Make:

Water Quality Meter: Hanna U-10

pH: 7.0
Temp.: 18.2
Cond.: 1.4
Oxygen: 9.8

Purge Start: 1020
Purge Stop: 1105
Purge Time: 43
Purge Rate: 0.63
Gal. Purged: 27

Sampling:

Method: Teflon Bailor

Analytical Parameters:

VO+15
MTBE
TBA

Sample #: MW-3
Sample Time: 1130
Appearance: clear
Odor: none
pH: 8.92
Temp.: 18.2
Cond.: 1.35
Oxygen: 9.80

Quest Environmental & Engineering Services, Inc.
Monitoring Well Field Sampling Record

Project: Getty Newark
Doremus Ave
Well #: MW-4

Date: 11/15/01
Weather: Overcast - Low 50s
Personnel: ANM, ATR

Initial Measurements:

PID (ppm): —
pH: 7.77
Temp: 17.7
Cond: 1.44
Oxygen: 7.44

Conversion Factors:

| Diam. | Gal/Ft. |
|-------|---------|
| 2" | 0.16 |
| 4" | 0.65 |
| 6" | 1.46 |

Well Diameter: 4"
Total Depth: 10.4'
Depth to Water: 2.4'
Depth to Product: N/A
Product Thickness: N/A
Water Col. Height: 8.0
Conversion Factor: 0.65
Gallons in Well: —
Gallons to Purge: 15.6
Approx. Pump Intake Depth: 9.0'

Well Evacuation:

Pump Type/Make: —

Water Quality Meter: Hanna HI-10

pH: 8.06
Temp.: 18.1
Cond.: 1.20
Oxygen: 8.09

Purge Start: 0920
Purge Stop: 1000
Purge Time: 40 MIN
Purge Rate: —
Gal. Purged: 160

Sampling:

Method: Teflon Bailor

Analytical Parameters:

Sample #: MW-4
Sample Time: 11:25
Appearance: Sheen (only upon close inspection)
Odor: Strong septic
pH: 8.02
Temp.: 18.0
Cond.: 1.33
Oxygen: 7.63

VO +15
MTBE
TBA
BN +15

Quest Environmental & Engineering Services, Inc.
Monitoring Well Field Sampling Record

Project: Getty Newark
Doremus Ave
Well #: MW-5

Date: 11/15/01
Weather: Overcast - 60s-50s
Personnel: ANM, AJR

Initial Measurements:

PID (ppm): —
pH: 6.9
Temp: 17°
Cond: 15K 20
Oxygen: 15K 10.0

Conversion Factors:

| Diam. | Gal/Ft. |
|-------|---------|
| 2" | 0.16 |
| 4" | 0.65 |
| 6" | 1.46 |

Well Diameter: 4"
Total Depth: 10.3'
Depth to Water: 2.36
Depth to Product: —
Product Thickness: —
Water Col. Height: —
Conversion Factor: 0.65
Gallons in Well: —
Gallons to Purge: 15.43
Approx. Pump Intake Depth: 6.00

Well Evacuation:

Pump Type/Make: Whisper (submersible)

Water Quality Meter: Horiba U-10

pH: 6.6
Temp.: 18°
Cond.: 1.5
Oxygen: 10.3

Purge Start: 10:20
Purge Stop: 11:06
Purge Time: 46 min
Purge Rate: 1250 l/min
Gal. Purged: 16
Final DTW - 4.62

Sampling:

Method:

Analytical Parameters:

VO + 15
MTBE
TBA

Sample #: MW-5
Sample Time: 11:41
Appearance: —
Odor: Septic
pH: 6.59
Temp.: 17.1
Cond.: 1.19
Oxygen: 9.79

Quest Environmental & Engineering Services, Inc.
Monitoring Well Field Sampling Record

Project: Getty Networks

Date: 11/15/01

Doremus Ave

Weather: 60s, clear

Well #: MW - 7

Personnel: ANM, AJR

Water case - May pump stop

Initial Measurements:

PID (ppm): -

Well Diameter: 4"

pH: 7.99

Total Depth: 13.2'

Temp: 17.2

Depth to Water: 4.28

Cond: 2.10

Depth to Product: N/A

Oxygen: 9.76

Product Thickness: N/A

Conversion Factors:

Water Col. Height: 8.92

Diam. Gal/Ft.

Conversion Factor: 0.65

2" 0.16

Gallons in Well: 5.79

4" 0.65

Gallons to Purge: 18 gal

6" 1.46

Approx. Pump Intake Depth: 11.0'

Well Evacuation:

Pump Type/Make:

Water Quality Meter: Hanna HI-10

pH: 8.12

Purge Start: 1221

Temp.: 17.6

Purge Stop: 1300

Cond.: 2.27

Purge Time: 39

Oxygen: 8.41

Purge Rate: 0.18

Gal. Purged: 7 gal - Dry

Sampling:

Method:

Analytical Parameters:

VO+15

Sample #: MW7

MTBE

Sample Time: 1355

TBA

Appearance: turbid

Odor: slightly septic

pH: 7.93

Temp.: 17.6

Cond. 1.95

Oxygen: 9.40

Quest Environmental & Engineering Services, Inc.
Monitoring Well Field Sampling Record

Project: Getty Newark
Doremus Ave
Well #: MW-8

Date: 11/15/01
Weather: ~60, clear skies
Personnel: ANM, ATR

Initial Measurements:

PID (ppm): —
pH: 7.70
Temp: 16.6
Cond: 1.33
Oxygen: 10.11

Conversion Factors:

| Diam. | Gal/Ft. |
|-------|---------|
| 2" | 0.16 |
| 4" | 0.65 |
| 6" | 1.46 |

Well Diameter: 4"
Total Depth: 16.5'
Depth to Water: 3.48
Depth to Product: N/A
Product Thickness: N/A
Water Col. Height: 13.02
Conversion Factor: 0.65
Gallons in Well: 8.46
Gallons to Purge: 25.5
Approx. Pump Intake Depth: 14.5'

Well Evacuation:

Pump Type/Make:

Water Quality Meter: //scriba 11-10

pH: 7.23
Temp.: 18.0
Cond.: 0.869
Oxygen: 10.16

Purge Start: 1315
Purge Stop: 1439
Purge Time: 24 min
Purge Rate: 0.31 gpm
Gal. Purged: 26

Sampling:

Method:

Analytical Parameters:

VO+15
MTBE
TBA

Sample #: MW-8
Sample Time: 15:00
Appearance: —
Odor: —
pH: ~~7.43~~ 7.43
Temp.: 17.1
Cond.: 364
Oxygen: 8.91

Quest Environmental & Engineering Services, Inc.
Monitoring Well Field Sampling Record

Project: Getty Newark
Doremus Ave
Well #: MW-9

Date: 11/15/01
Weather: Clear - Low 60's
Personnel: ANM, ATR

Initial Measurements:

PID (ppm): —
pH: 7.15
Temp: 18.1
Cond: 2.46
Oxygen: 11.33

Conversion Factors:

| Diam. | Gal/Ft. |
|-------|---------|
| 2" | 0.16 |
| 4" | 0.65 |
| 6" | 1.46 |

Well Diameter: 4"
Total Depth: 7.0'
Depth to Water: 3.12
Depth to Product: —
Product Thickness: —
Water Col. Height: 3.88
Conversion Factor: 0.65
Gallons in Well: 2.52
Gallons to Purge: 7.56
Approx. Pump Intake Depth: 7.0

Well Evacuation:

Pump Type/Make: Whorle (submersible)

Water Quality Meter: Hoba - V-10

pH: 8.20
Temp.: 19.3
Cond.: 1.24
Oxygen: 11.36

Purge Start: 13:10
Purge Stop: 13:33
Purge Time: 23 min
Purge Rate: 14 gal/min
Gal. Purged: 5.0 - Left 2' in water to insure sample - no recharge

Sampling:

Method: Teflon Bailer

Analytical Parameters:

VO+15
MTBE
TBA
BN+15

Sample #: MW-9
Sample Time: 14:48
Appearance: —
Odor: —
pH: 6.61
Temp.: 17.7
Cond: 2.09
Oxygen: 11.39

Quest Environmental & Engineering Services, Inc.
Monitoring Well Field Sampling Record

Project: Fetty Newark
86 Doremus Ave.
Well #: MW-12

Date: 11/15/01
Weather: Clear - low 60's
Personnel: A.M. - A.J.R.

Initial Measurements:

*Notified Ken about product existent in well.
upon his decision we abandoned purge and sample.*

PID (ppm): —
pH:
Temp:
Cond:
Oxygen:

Well Diameter: 4" *13:50 p.m.*
Total Depth: 10.5'
Depth to Water: 2.90
Depth to Product: 2.89
Product Thickness: .24"
Water Col. Height:
Conversion Factor: 0.65
Gallons in Well:
Gallons to Purge:
Approx. Pump Intake Depth:

Conversion Factors:

| Diam. | Gal/Ft. |
|-------|---------|
| 2" | 0.16 |
| 4" | 0.65 |
| 6" | 1.46 |

Well Evacuation:

Pump Type/Make: Whisper (submersible) Water Quality Meter: Hanna U-10

pH:
Temp.:
Cond.:
Oxygen:

Purge Start:
Purge Stop:
Purge Time:
Purge Rate:
Gal. Purged:

Sampling:

Method: Teflon Bailor

Analytical Parameters: V0+15
MTBE
TBA
BN+15

Sample #: MW-12
Sample Time:
Appearance:
Odor:
pH:
Temp.:
Cond.:
Oxygen:

*NOT
SAMPLED*

Quest Environmental & Engineering Services, Inc.
Monitoring Well Field Sampling Record

Project: Getty Newark
86 Poremus Ave.
Well #: MW-16

Date: 11/15/01
Weather: Clear - 60's (low)
Personnel: A.M. - A.J.R.

Initial Measurements:

PID (ppm): -
pH: 6.56
Temp: 17.5
Cond: 26.9
Oxygen: 9.36

Conversion Factors:

| Diam. | Gal/Ft. |
|-------|---------|
| 2" | 0.16 |
| 4" | 0.65 |
| 6" | 1.46 |

Well Diameter: 4"
Total Depth: 13.1'
Depth to Water: 4.70
Depth to Product: -
Product Thickness: -
Water Col. Height: 8.4 8.39
Conversion Factor: 0.65
Gallons in Well: 5.16 ~~8.45~~ 5.45
Gallons to Purge: 16.62 16.36
Approx. Pump Intake Depth: 11'

Well Evacuation:

Pump Type/Make: Whaler (submersible) Water Quality Meter: Hanna HI-10

pH: 7.66
Temp.: 15.6
Cond.: 1.90
Oxygen: 11.63

Purge Start: 12:21
Purge Stop: 12:50
Purge Time: 29
Purge Rate: 1/2 gal/min
Gal. Purged: 17

Sampling:

Method: Teflon Bailor

Analytical Parameters:

V0+15
MTBE
TBA
BN+15

Sample #: MW-16
Sample Time: 14:15
Appearance: -
Odor: Sulfur
pH: 6.36
Temp.: 15.8
Cond: 18.1
Oxygen: 11.59

Quest Environmental & Engineering Services, Inc.
Monitoring Well Field Sampling Record

Project: Getty Newark
86 Boerum Ave.
Well #: MW-17

Date: 11/15/01
Weather: ~55°, p. cloudy
Personnel: A.M.-A.J.R.

Initial Measurements:

PID (ppm): -
pH: 6.4
Temp: 17°
Cond: 3.7
Oxygen: 8.7

Conversion Factors:

| Diam. | Gal/Ft. |
|-------|---------|
| 2" | 0.16 |
| 4" | 0.65 |
| 6" | 1.46 |

Well Diameter: 4"
Total Depth: 14'
Depth to Water: 6.75
Depth to Product: n/a
Product Thickness: n/a
Water Col. Height: 7.25
Conversion Factor: 0.65
Gallons in Well: 4.71
Gallons to Purge: 14.13
Approx. Pump Intake Depth: 9.00

Well Evacuation:

Pump Type/Make: Whaler (submersible) Water Quality Meter: Horiba U-10

pH: 6.2
Temp.: 19°
Cond.: 1.1
Oxygen: 9.9

Purge Start: 09:30
Purge Stop: 10:05
Purge Time: 35 min.
Purge Rate: 1/2 gal/min.
Gal. Purged: 15
Final PTV - 8.21

Sampling:

Method: Teflon Bailor

Analytical Parameters: VO+15
MTBE
TBA
BN+15

Sample #: MW-17
Sample Time: 1114
Appearance: clear; no sheen
Odor: slightly septic
pH: 7.25
Temp.: 18.4
Cond. 0.788
Oxygen: 8.82